REMARKS

Upon receipt of this response, the Examiner is respectfully requested to contact the undersigned representative of the Applicant to arrange a telephone interview concerning the inventive merits of this application.

The drawings are objected to for the reasons noted in the official action. All of the raised drawing objections are believed to be overcome by the requested drawing amendments accompanying the attached Submission. New Replacement Sheets of formal drawing(s), accompany this Submission, and incorporate all of the requested drawing amendment(s). If any further amendment to the drawings is believed necessary, the Examiner is invited to contact the undersigned representative of the Applicant to discuss the same.

To simplify amendment of the specification, accompanying this response is a Substitute Specification which overcomes the informalities noted in the specification currently on file. Also accompanying this response is a copy of the previous version of the specification, i.e., a Marked-Up Specification, which shows the additions and deletions to the previous version of the specification. The accompanying Substitute Specification does not include any new subject matter and only includes the same changes which are indicated on the accompanying Marked-Up Specification. Please enter the Substitute Specification into the record of this case.

Next, claims 5-8 are rejected under 35 U.S.C. § 112, first paragraph, for the reasons noted in the official action. The inadequate written description rejection is acknowledged and respectfully traversed in view of the following remarks.

Initially, the Applicant would like to summarize the present invention. As can be seen in Figure 1, the four dark lines represent four grooves which are formed in the exterior surface of the shifting roll. The first dark line, extending along the right hand side of Figure 1, is straight except for the top portion of Figure 1 which has about a 45 degree jog to the right (for shifting to a reverse gear); the next, second from the right

side, dark line in Figure 1 is also straight except for a small somewhat triangular jog to the right (for shifting to a first gear) and then a small somewhat triangular jog to the left (for shifting to a second gear); the next, second from the left side, dark line in Figure 1 is also straight except for a small somewhat triangular jog to the right (for shifting to a third gear) and then a small somewhat triangular jog to the left (for shifting to a fourth gear); and the fourth dark line, extending along the left hand side of Figure 1, is also straight except for a small somewhat triangular jog to the right (for shifting to a fifth gear)–there also could then be a small somewhat triangular jog to the left (for shifting to a sixth gear) which is not shown, etc. A respective selector finger is located within each one of these grooves and is guided and controlled by the shape of the respective grooves and the pivoting orientation of the rocker elements 8, as the shifting roll rotates in a desired direction.

At least three of the grooves have one or more rocker elements 8 located along the grooves at specific locations for achieving the desired gear shifts. Each rocker element 8 is each pivotable about a respective pivot axis 6 and each respective pivot axis 6 extends generally normal to a longitudinal length of the groove. The pivot axis 6 is located off center with respect to the respective rocker element 8 so that the rocker element is supported in a cantilevered fashion. A spring 9 biases the shorter end (i.e., wedge-shaped tip 10, 11, 12, 13 or 14) of the rocker element 8, located adjacent the pivot axis 6, radially outward so that such end or wedge-shaped tip may normally interact with and assist with diverting the respective selector finger, e.g., to the right or the left depending upon the orientation of the rocker element 8, as the shifting roll rotates. However, if the shifting roll rotates at a sufficiently high enough rotational speed, the weight of the opposite end, i.e., wedge-shaped tip 1, 2, 3, 4 or 5, of the rocker element 8, overcomes the biasing force of the spring 9, so that the opposite end, i.e., wedge-shaped tip 1, 2, 3, 4 or 5, of the rocker element 8 pivots radially outward, about the axis 6, while the opposite shorter end, i.e., wedge-shaped tip 10, 11, 12, 13

or 14, pivots radially inward about the pivot axis 6. As a result of such pivoting movement of the rocker element 8, the opposite end, i.e., wedge-shaped tip 1, 2, 3, 4 or 5, of the rocker element 8 is now able to interact with and divert the respective selector finger as the shifting roll rotates while the shorter end, i.e., wedge-shaped tip 10, 11, 12, 13 or 14 of the rocker element 8 is no longer able to interact with and divert the respective selector finger.

Due to this arrangement, if all of the respective selector fingers are located adjacent the top of the page and if the shifting roll rotates at a relatively slow speed, in the direction toward the top of the page, the respective selector finger will each be guided, downward along the page and along the respective groove, so that a second selector finger (traveling along the groove located second from the right in the sole Figure) successively contacts and is diverted by the respective shorter end 14 of the first gear rocker element 8 so that the respective selector finger will move along the path outlined by the respective dark groove line shown in Figure 1 and shift to the first gear. Further rotation of the shift roll, toward the top of the page, will disengage first gear and then the respective selector finger will engage the shorter end 13 of the second gear rocker element 8 so that the respective selector finger will move along the path outlined by the respective dark groove line shown in Figure 1 to shift to second gear.

Further rotation of the shift roll toward the top of the page will successively shift to third gear, fourth gear, via the selector finger traveling along the groove located second from the left side in Figure 1. Still further rotation of the shift roll, toward the top of the page, will successively shift fifth gear, and so forth, via the selector finger traveling along the groove located along the left side of Figure 1.

If, however, all of the respective selector fingers are located adjacent the top of the page and if the shifting roll rotates at a sufficiently high enough speed, in the direction toward the top of the page so that the weight of the opposite end 1, 2, 3, 4 or

5 of the respective rocker elements 8 overcome the biasing force of the spring 9, then the shorter end (tip 10, 11, 12, 13, 14) of the rocker element is pivoted radially inward, about the pivot axis so that the shorter end (tip) 10, 11, 12, 13 or 14 of the respective rocker element 8 is no longer able to interact with and divert the respective selector finger along the path outlined by the respective dark groove line in Figure 1. As a result of this, the respective selector finger travels along the a straight path shown in dashed lines in Figure 1, i.e., the small somewhat triangular jog to the left or the right is avoided and the respective gear(s) is "skipped" during an upshift or a downshift–depending upon the rotational direction of the shift roll.

In view of the above, the Applicant respectfully submits that in view of the above clarification, all of the raised rejected under 35 U.S.C. § 112, first paragraph, rejections should be withdrawn at this time.

Next, claims 5-8 are then rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for the reasons noted in the official action. The rejected claims are accordingly amended, by the above claim amendments, and the presently pending claims are now believed to particularly point out and distinctly claim the subject matter regarded as the invention, thereby overcoming all of the raised § 112, second paragraph, rejections. The entered claim amendments are directed solely at overcoming the raised indefiniteness rejection(s) and are not directed at distinguishing the present invention from the art of record in this case.

Next, claims 5-8 are rejected, under 35 U.S.C. § 102(b), as being anticipated by Bart `645 (DE 19543645). The Applicant acknowledges and respectfully traverses the raised anticipatory rejection in view of the following remarks.

Turning now to Bart `645, the Applicant acknowledges that this reference arguably refers to a gearchange cylinder 10 which is provided with a pattern of groves on the exterior surface thereof. Each groove arguable interacts with control switches to bring about gear shifts. The gearchange sleeve 10 is moved between any two gear

settings to operate the synchromesh for the gear ratios. This allows switching between any two gears and is especially used for small engines, such as motorcycles.

It is respectfully submitted that although the gearchange cylinder 10 somewhat resembles the shifting roll, according to the present invention, it is specifically noted that Bart `645 fails to in any way teach, suggest or disclose or remotely hint at the pivotable rocker elements 8, as presently claimed.

Claims 5-8 are then rejected, under 35 U.S.C. § 102(e), as being anticipated by Bigi `319 (U.S. Publication No. 2003/0213319). The Applicant acknowledges and respectfully traverses the raised anticipatory rejection in view of the following remarks.

Turning now to Bigi `319, the Applicant acknowledges that this reference also arguably relates to a shifting roll 29 (Fig. 8) which is rotatably guided on an axis 17 with grooves 30 located thereon and selection fingers 13 engaged within the groves 30. However, the Applicant respectfully disagrees that Bigi `319 in any way teaches, suggests, discloses or remotely hints at pivotable rocker element which are spring biased by spring 9, as presently claimed. In particular, the presently pending claims are now amended to recite that the spring 9 interacts with the rocker element 8 to pivot one end or tip thereof radially outwardly while also simultaneously pivoting the opposite end or tip radially inwardly.

In order to emphasize the above noted distinctions between the presently claimed invention and the applied art, each of the independent claims of this application now recite the features of "....wherein the rocker elements are located proximate an outer circumference of the shifting roll and each rocker element is provided, on each respective end thereof, with a wedge-shaped tip (1, 2, 3, 4, 5; 10, 11, 12, 13, 14), and a compresssing spring (9) is located on one side of the rotatable axle (6) which exerts a pivoting force upon the respective wedge-shaped tips (1, 2, 3, 4, 5)...." New independent claims 9 and 14 recite similar limitations. Such features are believed to

clearly and patentably distinguish the presently claimed invention from all of the art of record, including the applied art.

The Applicant respectfully submits the aforementioned features are believed to clearly and patentably distinguish the presently claimed invention from all of the art of record, including the applied art. If any further amendment to this application is believed necessary to advance prosecution and place this case in allowable form, the Examiner is courteously solicited to contact the undersigned representative of the Applicant to discuss the same.

In view of the above amendments and remarks, it is respectfully submitted that all of the raised rejection(s) should be withdrawn at this time. If the Examiner disagrees with the Applicant's view concerning the withdrawal of the outstanding rejection(s) or applicability of the Bart `645 and/or Bigi `319 references, the Applicant respectfully requests the Examiner to indicate the specific passage or passages, or the drawing or drawings, which contain the necessary teaching, suggestion and/or disclosure required by case law. As such teaching, suggestion and/or disclosure is not present in the applied references, the raised rejection should be withdrawn at this time. Alternatively, if the Examiner is relying on his/her expertise in this field, the Applicant respectfully requests the Examiner to enter an affidavit substantiating the Examiner's position so that suitable contradictory evidence can be entered in this case by the Applicant.

In view of the foregoing, it is respectfully submitted that the raised rejection(s) should be withdrawn and this application is now placed in a condition for allowance. Action to that end, in the form of an early Notice of Allowance, is courteously solicited by the Applicant at this time.

The Applicant respectfully requests that any outstanding objection(s) or requirement(s), as to the form of this application, be held in abeyance until allowable subject matter is indicated for this case.

In the event that there are any fee deficiencies or additional fees are payable, please charge the same or credit any overpayment to our Deposit Account (Account No. 04-0213).

Respectfully submitted,

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[001] # SHIFT DEVICE FOR A TRANSMISSION

[002] This application is a national stage completion of PCT/EP2004/006120 filed June 7, 2004 which claims priority from German Application Serial No. 103 30 158.5 filed July 4, 2003.

[003] ## FIELD OF THE INVENTION

[004] The present invention concerns a shift device for a transmission with a cam drive, which has a shifting roll guidedly rotatable about an axle, as well as selector fingers which engage in grooves on said shifting roll and are regulated therein.

[005] ## BACKGROUND OF THE INVENTION

[006] Known to the practice are shift devices for speed-changing transmissions for motor vehicles, which have a cam drive for creating movements of the shifting forks, which are connected to selector fingers. The control contouring of the cam drive is in the form of grooves on the circumference of the shifting roll whereby a control curve has been designed for each shifting form. The selector finger, which is linked to the shifting fork, engages itself in such a manner, that upon rotation of the shifting roll, a continuing shifting motion in an axial direction of the shifting roll is made available on the selector fingers which motion runs from downshift to an upshift gear stage or conversely from an upshift stage into a downshift stage. During the shifting operation, the shifting forks, respectively, run through an idling position between two gear stages.

[007] In the case of multiple-downshifts, these shift devices have the disadvantage that a fixed sequence of shifting operations must be observed. This means that, in the case of a multiple-downshifting, continually one gear stage after another must be engaged and then disengaged, until the desired gear stage is activated in the transmission. The sequential succession of shifts leads to a considerable prolongation of the total time of shifting.

[008] In the case of multiple-downshifting, in order to overcome this disadvantage, the practice has moved in a direction, wherein the desired gear stage is selected in a direct manner that means without a sequential run of shifts in the transmission. For this purpose, the shifting forks, in the case of multiple-downshifting, which are in a position corresponding to the actual shifted-into gear stage, are taken out of the present engagement with the shifting roll and guided into their neutral position with the aid of equipment adapted to that purpose.

[009] Subsequently, the shifting roll has rotated so far in the direction of the downshifting that the position, corresponding to the shifting forks for the desired gear stage has been attained and the shifting forks can be run out of their neutral position. By way of this method of operation, in the case of multiple-downshifting, the sequential shifting through each gear stage is redundant, whereby in this multiple-downshifting through several gear stages, that is "gear jumps", considerably shorter shifting times are achieved.

[010] DE 195 09 477 teaches of a shift device wherein, during multiple-downshifting, the shifting equipment, which finds itself in its idling position, is brought out of engagement with the controlling cam, whereby a movement of the shifting equipment into a shifting direction out of the idling position is blocked and the shifting roll, without releasing interposed shifting in the transmission, turns into the desired positions.

[011] After this, the shifting equipment is once again brought into its engagement with the cam control of the of the shifting roll.

[012] At the base of the controlling cams are provided traversable ramps in the direction of shifting roll rotation for downshifting. These are situated in front of the shifting path curvature of the cam control so that the selector fingers are blocked from the shifting direction by a restraining apparatus during multiple-downshifting as they approach these ramps.

[013] The above situation still has the disadvantage that, during a traversing of the ramps to achieve the blocking by the restraining apparatus, which is provided with the shifting forks and which forks, in turn, are bound to the selector fingers, the system is burdened by complex construction, whereby high fabrication costs are caused and additional controls must be provided.

[014] In order to avoid this disadvantage, ~~DE-A-(File No.: 8178 Z)~~ DE 102 03 633 A1 proposes a shift device for a transmission with a cam drive, which has a shifting roll with at least one groove, wherewith, at least one selector finger engages itself therein so that, upon a rotation of the shifting roll, the selector finger moves axially and whereby the groove possesses for shifting up, an upgear groove designed as an upward shifting path and, conversely, for downshifting, has a downshift path. In this design, the downshift path is constructed as a downshift groove, which conducts the selector finger, during downshifting or during multiple-downshifting, into a axial shift position equivalent to a neutral position.

[015] The downshift groove is provided with an effective blocking means, which is active during a shifting roll direction of rotation equivalent to an upshift so that

the selector finger, during an upshift is guided by the upshifting groove and during a downshift is guided by a downshift groove.

[016] By way of this design of the downshift path as a downshift groove, which places the selector finger into a shifting position equivalent to a neutral position during a multiple-downshift occurrence, it is possible that multiple-downshift operations can be carried out without a running through of sequential gear stages, whereby shorter shifting times can be achieved.

[017] The provision of a blockage apparatus in the downshift groove, which is effective in a direction of rotation of the shifting roll equivalent to a upgear shift direction thereof, leads to a situation where the ~~shifting roll~~ selector finger is guided through an upshift groove during an upshift and during a multiple-downshifting is guided through a downshift groove to the end that the selector finger upon upshift or, during multiple-upshifting, is guided by the sequential upshift path and during multiple-downshifting is guided in a direct path into its neutral position. Thereby, the desired reduction of the shifting time is achieved by multiple-downshifting. ✓

[018] In the case of the above described known shift device, however, a multi-path of the shifting roll is yet to be considered and also a reversal of the direction of rotation of the shifting roll between the upshifting and the downshifting is necessary.

[019] The purpose of the present invention is to create a device, with which the gear stages both, in the case of upshifting as well as downshifting, are freely selectable without a sequential run through gear stage positions, and without the necessity that a multi-path course of the shifting roll must be run through or a reversal of the direction of rotation thereof becomes necessary.

[020]

[021] SUMMARY OF THE INVENTION

[022] The proposal is made that a shift device be designed as a passive, speed of rotation controlled system, wherein finding the goal to be attained, for either upshifting or downshifting, would be considered as a function of the speed of rotation of the shifting roll, which attainment would be enabled by centrifugal force engendered by the speed of rotation.

[023] According to the invention, provision has been made within the framework of an advantageous embodiment of the present invention that ~~rocker-elements~~ rocker elements are placed on the outer circumference of the shifting roll, which rocker elements have wedge-shaped tips. These tips are so placed about a ✓ ✓

~~turning~~ rotational axle that they can engage themselves into an appropriate groove, whereby the ~~axle of~~ rotational axle is ~~parallel~~ perpendicular to the appropriate groove and whereby a compression spring is located ~~on~~ to one side of the ~~turning~~ rotational axle of the rocker element. In this way, the wedge-shaped tips of the rocker elements determine the path of the selection fingers for both upshifting and downshifting. The compression spring, which exerts its force upon the rocker element, serves to make certain that if a shifting roll is rotating slowly, the wedge-shaped tips of the rocker elements so engage in a groove. If the shifting fork finds itself in the neutral position with the shifting finger and the shifting roll turns back, the shifting finger, as in a case with conventional shift devices, transfers out of the neutral groove and into the (inclined) gear groove so that a desired gear position is obtained.

[024] Conversely, if the shifting roll is rotating more rapidly, then ~~the~~ because of a rotational axle (axis) for the rocker element, which ax~~le~~is is located ~~symmetrically beside the groove, carries out an action, so that~~ perpedicular to the respective groove, an action is carried out so that, because of increased centrifugal force, a torque is brought about on the rocker element~~, because of increased centrifugal force, to the end that~~ which opposes the spring force ~~is opposed~~. By this activity, the rocker element~~s~~ pivot~~s~~ about ~~its axle of rotation,~~ their rotational axis so that the wedge-shaped tips are forced out of engagement with the ~~groove~~ fingers. The respective selector finger, as a result, is no longer diverted into the direction of the gear groove, but is allowed to remain in the neutral position.

[025] When upshifting occurs, then the operational principle reverses itself, because of the asymmetrical arrangement of the rocker ~~element~~ elements. That is to say that in a case of slower rotation of the shifting roll, the selector finger remains in the neutral position and upon a more rapid rotation thereof, is directed into the gear groove.

[026] The invented design of the shift device offers more advantages. First, an additional actuator can be eliminated, since now a "passive" employment of the centrifugal force on these grounds, has the effect that gear stages, both in upshifting and downshifting, become freely selectable so that a running through of gear sequences can be done away with. Second, there is no necessity that the shifting roll must travel through a multi-gear path nor carry out a reverse of direction, because no greater paths exist to force such action.

[027] In a case of simple shifting, because of an identical shifting procedure, the same shifting time is necessary as in the case of the conventional shift devices

which have a shifting roll. In the case of multiple shifts, the desired gear position is found directly without multiple paths and without a rotational direction reversal of the shifting roll. In this way, a clear diminution of the shifting times has been achieved, because of the elimination of the no longer needed mutual synchronization.

[028] BRIEF DESCRIPTION OF THE DRAWINGS

[029] The invention will now be described, by way of example, with reference to the accompanying drawings in which:

[030] ~~The single~~ Figure 1 is a development of a shifting roll~~.~~; and

Figure 2 shows the finger engaging with a groove of the shifting roll.

[031] DETAILED DESCRIPTION OF THE INVENTION

[032] Since shift devices with shifting rolls are well known to those ~~expert,~~ skilled in the ~~given~~ art, in Figure 1 only those components which are necessary for understanding the invention are presented in a purely schematic manner. As shown in Figure 2, the the shifting roll 7 is rotatably about an axle A and the shifting roll has grooves G thereon as well as a respective selection finger F which can engage within each respective groove.

[033] The rocker elements, which find their place on the outer circumference of the shifting roll, are designated with the reference number 8, whereby these each turn about a respective rotational ax~~le~~is 6, which ~~axle~~ is ~~set~~ arranged so as to be ~~parallel along side of~~ perpendicular to the corresponding groove. Each groove of the shifting roll possesses an encircling neutral groove, which has a connection with the appropriate gear stage. The rocker elements 8 are provided, on one ~~side~~ end with wedge-shaped tips 1, 2, 3, 4, 5 and, on the other ~~side,~~ end with wedge-shaped tips 10, 11, 12, 13, 14 and are located so ~~placed~~ that the wedge-shaped tips 1, 2, 3, 4, 5 determine the path of the selector fingers F during upshift and downshift. For this purpose, ~~the~~ a compression spring 9 is arranged on one side of ~~each~~ the rotational ax~~le~~is 6 of each rocker element 8 ~~is so loaded by a compression spring 9,~~ which loads the rocker element in that way so that one of the associated wedge-shaped tips ~~engage in~~ is located within the groove.

[034] The force of the spring 9 is ~~so~~ regulated so that, during a slow rotation of the shifting roll, the engagement of the wedge-shaped tip remains in place so that, if the shifting fork finds itself with the corresponding selector finger in the neutral position and the shifting roll ~~turns~~ rotates backwards, the selector finger F is

diverted out of the neutral groove and transferred to the gear stage groove in the same manner as is carried out in the case of the conventional shift devices which have shifting rolls.

[035] Otherwise, in the event of a quick rotational reversal of the shifting roll, because of the asymmetrical design of the rocker elements 8 on their rotational axes 6, the rocker element ~~is~~s are subjected to a torque, due to the occurring centrifugal force, which works ~~counter to~~ against the biasing force of the spring 9 so that the rocker element~~s~~ pivot~~s~~ and ~~its~~ the pivoted wedge-shaped tip cannot engage itself in the respective groove. By this means, the selector finger F is no longer diverted, but remains in the neutral position as a result of this quick rotational reversal of the shifting roll.

[036] The operating principle reverses itself in the case of upshifts so that, in such cases, upon a slow ~~turning~~ rotation of the shifting roll, the selector finger F remains in the neutral position and, contrarily, upon a rapid turning of the shifting roll, is diverted in the direction of the shifting groove.

[037] In the following, the functioning of the invented shift device is explained in details.

[038] Simple Downshift

[039] The shifting roll is slowly reversed, under which circumstances, the force of the compression spring 9 is greater than the torque ~~called up~~ created by centrifugal force. As a result, the wedge-shaped tips 1, 2, 3, 4, 5 of the rocker element~~s~~ 8 remain in neutral engagement and are capable of being shifted in a sequential manner. This is inevitable if the force of the spring is not overpowered by centrifugal force.

[040] Multiple (double) downshifting

[041] The shifting roll is, first, placed in rapid, reverse speed of rotation. As this occurs, the wedge-shaped tips 1, 2, 3, 4, 5 of the rocker elements 8 are not in engagement with a respective groove so that the selector finger~~s~~ F remain~~s~~ in the neutral position. Following the occurrence of the corresponding rocker element 8 (before approaching the desired gear stage to be engaged), the speed of rotation of the shifting roll is reduced to such an extent that all rocker elements are again in a groove engagement. The selector finger F is now diverted in the gear groove and the corresponding gear position is attained.

[042] Simple upshifting

[043] The shifting roll is turned at a high rotational speed, so that the rocker elements 8 are in groove engagement by their wedge-shaped tips 10, 11, 12, 13, 14 and shifting in a sequential manner is possible.

[044] Multiple (double) upshifting

[045] The shifting roll is turned at a slow speed in the direction of upshifting so that the deflecting wedge-shaped tips 10, 11, 12, 13, 14 are not in groove engagement and the selector fingers F remains in the neutral position. Before the desired gear stage is shifted into, the shifting roll is rotated rapidly so that now the wedge-shaped tips 10, 11, 12, 13, 14 are in groove-engagement, a selector finger F is diverted into a gear groove, and the desired gear stage is shifted into.

[046] The invented embodiment of the shift device also enables a passively, regulated choice for upshifting as well as for down shifting, these serving as a function of the speed of rotation of the shifting roll and with the usage of the centrifugal force which arises thereby. Although an especially advantageous embodiment has been described, the fundamental concept of the invention can be applied to additional appropriate operations.

Reference numerals

1 tip
2 tip
3 tip
4 tip
5 tip
6 ~~axle of rotation~~ rotational axis for the rocker element ✓
7 shifting roll ✓
8 rocker element carrying tips and spring ✓
9 compression spring
10 tip
11 tip
12 tip
13 tip
14 tip
N neutral position ✓
R reverse gear ✓
1' first gear ✓
2' second gear ✓
3' third gear ✓
4' fourth gear ✓
5' fifth gear ✓
A roll axle ✓
F selector finger ✓
G groove ✓
✓

ANNOTATED SHEET

~~ZF 8652 Z~~

~~04-07-08~~

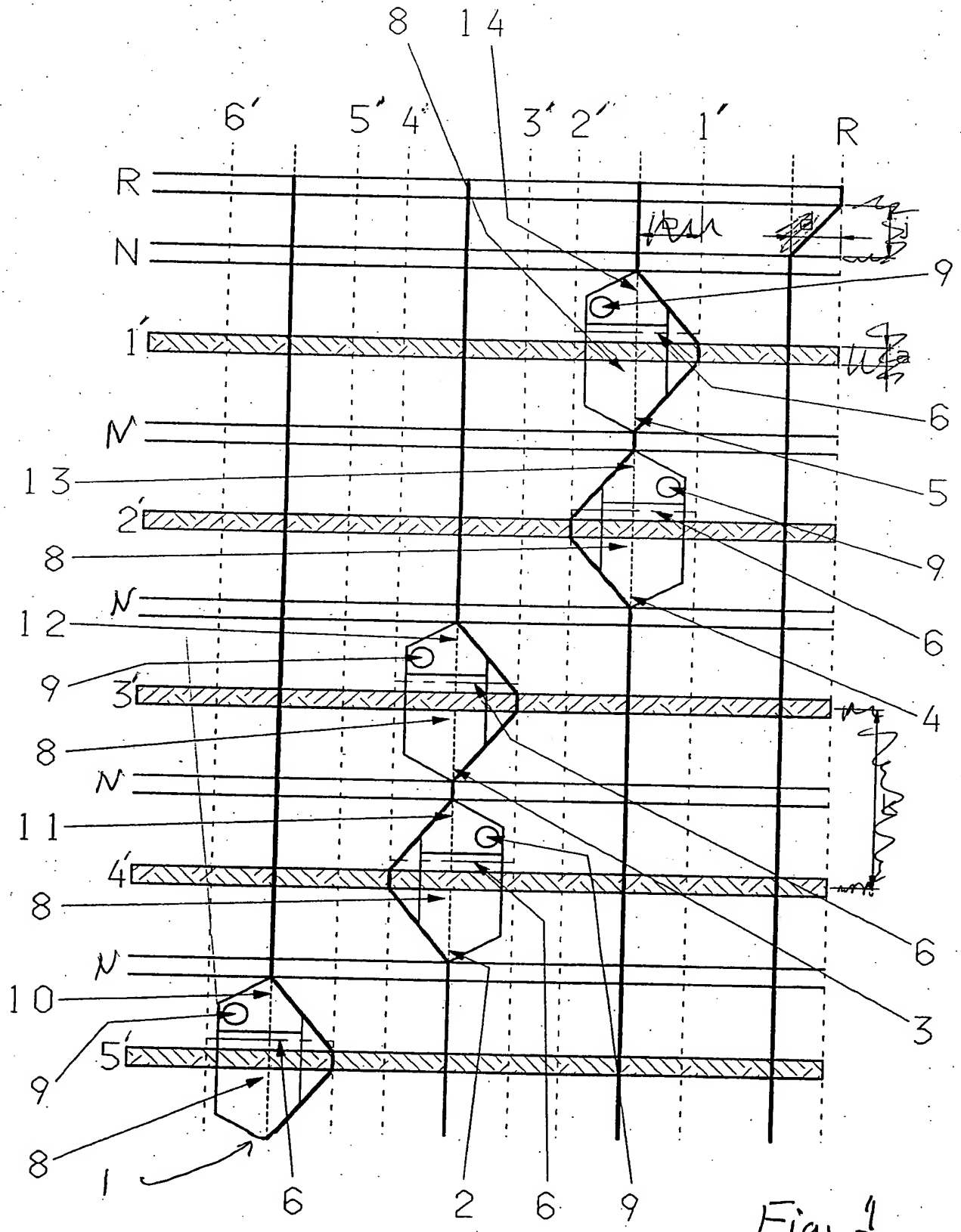

Fig. 1